BETTER FRUIT

The Pioneer Horticultural Journal of the Pacific Northwest

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Features of This Issue:

Pruning Studies in California
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Soil Fertility as Related to Orcharding
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Gummosis of the Cherry

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Pruning Studies in California

By WARREN P. TUFTS

Assistant Professor of Pomology, University of California

STYLES in pruning change, perhaps not as often as do fashions in women's wearing apparel, nevertheless, as one travels from section to section, the fact is emphasized that there is apparently a great difference of opinion as to how fruit trees should be handled in this respect.

Although generalizations are dangerous, the statement will be hazarded that the California pruning method has, in the past, been characterized by the severity of the cutting. In some fruit sections of the West, the opposite extreme of little or no pruning may undoubtedly be found.

The cutting of young trees is primarily designed to influence the forms, however, the functions of the plant are also profoundly altered. "If you would have your trees stocky, strong, and mechanically able to support heavy crops, prune your orchard severely for at least four years after planting," has been the advice commonly heard in nearly all deciduous fruit growing sections of California.

Considered from the standpoint of plant nutrition, it would seem that annually to remove a large portion of the leaf bearing area, which is the factory of food production for the tree, in addition to the loss of stored food reserves, would of itself tend to weaken the life processes of the plant. The fact, however, that orchard trees have in almost all cases responded to the heavy cutting with an exuberant vegetative growth the following season has misled many to believe that annual shoot growth alone is the true index of the plant's vigor.

Is it not, however, more accurate to measure the tree's activity by the total weight of wood laid down over the whole plant?

Experiments by the California Experiment Station have shown that a very close correlation exists between the diameter of the trunk of a non-bearing tree and the weight of both top and root. Any pruning practice which gives a greater girth in the young tree may be safely taken as an index of a larger development over the entire plant.

Careful experiments and studies in pruning effects on deciduous fruit trees have been made in California in recent years, largely under the lead of Professor Tufts. These have convinced this widely known pomologist and many others that certain pruning practices of the past have not been founded on sound principles. The findings for instance, are against severe heading back of young trees and favor the "long system" of pruning, in general. These findings are making a strong impression on California growers of deciduous fruits, particularly where there is little or no irrigation. The report here given deserves unbiased study by all readers of BETTER FRUIT *and is of particular import to those in unirrigated sections.*

The facts just presented perhaps rather completely explode another tradition heard in many fruit sections, namely, that heavy cutting of the top, although perhaps reducing the size of the above-ground parts, nevertheless results in renewed and strengthened root development.

RESULTS of apple pruning investigations in England, Oregon, West Virginia and other sections show that the less the tree is pruned the larger and heavier it becomes. In order to ascertain whether these results hold equally well with other deciduous fruits careful measurements were made in the California Experiment Station orchards at Davis, California.

The experimental trees were planted in deep, rich, alluvial loam soil, had not been irrigated up to the time of these measurements and, with the exception of the pruning, had received identical cultural treatment. Table No. 1 briefly summarizes the results of the different pruning treatments after one season's growth.

In order to secure data on the stockiness of branches as influenced by different pruning treatments, measurements were made on apricot trees which had been only lightly pruned, others which had been moderately, and still others which had been severely pruned. All measurements were made at a height of three feet from the ground, the trees having been evenly headed at the time of planting. The results of these measurements are exactly in accord with those made on the trunk. Certain German investigators have reported similar findings with apple branches.

The figures of Table 2 summarize these observations.

TABLE II.
INFLUENCE OF PRUNING ON STOCKINESS OF BRANCHES

Average Increase in Circumference in Centimeters.

Fruit	Heavily Pruned	Moderately Pruned	Lightly Pruned
Apple	8.4 Cm.	9.5 Cm.	11.7 Cm.
Apricot	3.85	4.66	5.09

TABLE I.
INFLUENCE OF PRUNING ON STOCKINESS OF TRUNK

Average Increase in Circumference in Centimeters.

Kind of Fruit	Pruned Severely	Pruned Moderately	Pruned Lightly
Apricot	11.7 Cm.	12.6 Cm.	15.3 Cm.
Cherry	10.0	11.2	12.3
Peach	12.0	16.9	19.4
Pear	8.7	9.1	9.7
Plum (Japanese)	6.3	10.4	11.3
Plum (European)	7.2	8.8	9.4
Prune	6.2	7.1	8.4
Average	8.9	10.9	12.3

Another set of measurements presents data perhaps still more interesting and instructive. Several hundred strongly vegetative shoots of two, three and four-year-old French prune and Bartlett pear trees were selected and comparable branches headed in such a way as to leave 12, 24 and 36 inches of the new growth. Table 3 summarizes the results obtained on the prune trees. Similar results were obtained from the pear trees.

These figures seem to indicate that heading-back new growth on young non-bearing trees reduces, in direct ratio to its severity, resultant new shoot growth, stockiness and number of spurs formed.

TABLE III.
INFLUENCE OF SEVERITY OF PRUNING ON DEVELOPMENT OF ONE-YEAR SHOOTS OF FRENCH PRUNE

Shoots of Equal Size Pruned to	12 inches	24 inches	36 inches
Circumference at Base	.57 inches	.74 inches	.92 incehs
Number of Spurs Formed	4.68	9.43	14.30
Length of New Shoots	154 inches	230 inches	284 inches

SUMMER pruning non-bearing trees, whether performed early or late in the season, exerts a marked influence on vigor as measured by trunk increments. During the summer of 1916 four blocks of flourishing two-year-old trees consisting of apricots, cherries, peaches, pears, plums (Japanese and European) and prunes were subjected to various treatments.

Block A (152 trees) received no summer pruning, and the average increase of trunks was 7.5 centimeters. Block B (252 trees) received a moderate thinning-out and heading-back on May 4, and the average increase of the trunks was 6.5 centimeters. Block C (96 trees) received a moderate thinning-out and heading-back on May 4, and again on July 11, and the average increase of the trunks was 5.2 centimeters. Block D (30 trees) received a moderate thinning-out and heading-back on August 8, and the average increase of the trunks was 5.4 centimeters. There were only apricots, cherries and pears in this block.

From the figures just presented its seems that summer pruning at any time is devitalizing, and that midsummer cutting is more weakening than that done during the early part of the season. It is to be further noted that two comparatively early summer prunings were only a little more weakening than one given late in the growing period.

It is not the intention to give the impression that little or no pruning of young trees is desirable, but rather that the orchardist should bear in mind the observations herewith presented and shape his pruning practices with the end in view of obtaining the advantages to be derived from a knowledge of the facts.

Attention should, at this point, be drawn to the fact that the same principles or factors governing the growth of non-bearing trees do not necessarily hold when bearing trees are considered. The most excellent pruning investigations in progress at the Oregon Experiment Station have already yielded results which emphasize this statement.

In order better to comprehend certain plant responses, facts should be recalled concerning the annual cycle of growth and developement of the fruit tree. The season's first burst of growth—blossoms, leaves, and new shoots—is made largely at the expense of plant food reserves, normally stored in the tree during the preceeding summer and fall. These stored plant reserves are thus very materially used up during the early part of the summer and as a consequence concentration of the cell sap is lowest at this time. The crude sap taken up by the roots is transported to the leaves where, with carbon dioxide from the air, the complex plant foods are elaborated. After the active vegetative period of early summer is past the plant begins to store such elaborated foods as are not needed for the promotion of diameter growth, nourishment of the fruit crop and development of fruit buds for the succeeding spring. As the season advances the cell sap, under favorable growth conditions, becomes more and more concentrated, indicating the storage of reserves for the winter months and the following year's growth. Any practice which will aid this normal development of the tree should materially benefit succeeding wood and fruit production.

IT HAS been demonstrated many times that heavy cutting during the dormant period will result in rank succulent vegetative growth the following season. Unfortunately many growers have mistaken these rapidly growing shoots as a sure indication of a healthy and vigorous condition of the tree. Pruning, however, may be so severe that the proper balance between the vegetative and reproductive functions are disturbed to such an extent that the new growth will take practically all the plant's energies to maitain and extend it far beyond the proper time for the termination of such devepoment and the beginning of storage of synthesized plant foods.

Excessive pruning results in rank vegetative growth near the pruning cut which, with its soft, succulent, spongy tissue, is probably wasteful in its use of soil moisture and also in times of stress may even withdraw water from the green fruit. If soil moisture conditions are not remedied shortly the tissues of the wilted, immature fruit become irreparably injured. In sections of limited rainfall, or where irrigation water is not plentiful, the question of what type of tissue uses the greatest amount of water is most important. The data secured from careful experimentation are meagre and seem somewhat contradictory, but from field observations it appears that trees and especially vegetables with very succulent growth are those which suffer first from a deficiency of soil moisture.

The later the tree continues its active prolongation of new wood during the season, the less is the opportunity to store plant food reserves and, therefore, the less is the concentration of the cell sap. It

(*Continued on page* 23)

Comparison of trees in background with those in foreground shows plainly how an application of miscible oil retards the buds in the spring.

Miscible Oils and Fruit-Tree Leaf Roller

By J. R. Parker
Montana Experiment Station, Bozeman

Experiments with spray materials, when scientifically carried out by experts, are certain to add something to the sum total of existing knowledge about them. The question of virtues and efficacy of miscible oil sprays for this or that disease or pest is still one of keen debate. Every wide-awake horticulturist must be glad to learn anything he can from the experiences of others. With this in mind we print here the results obtained in combating leaf-roller on a small scale in Montana, by Professor Parker and associates. If his report provokes reply and elicits further discussion, so much the better for those studying the uses of miscible oils.

THE fruit-tree leaf roller (*Archips argyrospila*) for the past two seasons has been extremely injurious in several of the largest apple orchards in the Bitter Root Valley and during the same time has also appeared in injurious numbers in a number of localities in Washington and Oregon. The enormous damage this insect is capable of doing, the difficulty of its control and its ability to increase and spread very rapidly make it one of the most dangerous orchard pests with which the fruit growers of the Northwest have to contend. Because of the general interest with which the leaf-roller is now regarded, our experience in Montana in attempting to control this pest with miscible oils is herewith presented.

The spraying tests were conducted jointly by R. K. Thompson, manager of the University Heights Orchard Company, the Division of Horticulture of the Montana State Department of Agriculture, and the Montana Experiment Station. The general arrangement was for Mr. Thompson to furnish the trees and spraying equipment and for W. L. Shovell, now Chief of the Division of Horticulture, and Mr. Thompson to jointly supervise the actual spraying operations. The writer aided in planning the experiments and in checking up the results.

Results of Spraying in 1920—The first appearance of the leaf-roller in Montana in injurious numbers was at University Heights orchard, at Darby, in 1919. During that season damage was done over a very small area, b t the moths appeared in great numbers and laid eggs very heavily over an area of about 400 acres, many of the trees having from 200 to 300 egg-masses. R. K. Thompson, manager of the orchard, realizing that the great quantity of eggs laid in 1919 meant trouble the following year, immediately took steps to find out the best known method of control.

Entomologists in several states who had had experience with the leaf-roller were consulted and all agreed that spraying with miscible oil had proved the most successful of all the control methods that had been tried. Mr. Thompson also wrote to the Montana Experiment Station for aid, but we had had no previous experience with the leaf-roller and could only hand along the recommendation of entomologists in leaf-roller states which, as Mr. Thompson already knew, was miscible oil.

Acting on these recommendations, the University Heights Orchard Company bought two car loads of miscible oil known as Spra-Mulsion. Four hundred acres were sprayed with this oil in the spring of 1920, 250 acres being sprayed early at the rate of seven gallons of oil in 100 gallons of water and 150 acres at the rate of 8 gallons of oil in 100 gallons of water.

The early spraying was done under unfavorable conditions, the weather being cold and cloudy and the spraying was interrupted by storms. The later spraying was done under ideal spraying conditions, the weather being warm and clear. The first spraying gave practically no results, while the later spraying at the stronger strength gave only 50 to 60 per cent control. As a result the trees over approximately 300 acres were almost completely defoliated, great numbers of moths matured and eggs were laid over a much larger territory than in 1919.

Winter Spraying Experiments in 1920—The costly and negative results from the use of Spra-Emulsion in 1920, together with the enlarged area of infestation presented a very dicouraging outlook for the following year. Miscible oil is a highly expensive insecticide and no one wanted to put money into it

TABLE I—RESULTS OF WINTER SPRAYING WITH MISCIBLE OILS TO CONTROL LEAF-ROLLER

Brand and Strength	Infested branches sprayed with hand sprayer in greenhouse, Nov. 20, 1920		Infested branches sprayed in orchard with power sprayer Dec. 1, 1920, and cut three weeks later	
	No. of Egg Masses	Percent of Eggs Unhatched	Percent of Eggs Unhatched	No. of Egg Masses
Dormoil, 1 to 12½	149	78	87.9	339
Scalecide, 1 to 15	111	60	48.5	309
Soluble, 1 to 12½	103	18	16.1	417
Unsprayed Checks	158	2	7.6	367

TABLE II—RESULTS OF SPRING SPRAYING WITH MISCIBLE OIL TO CONTROL LEAF-ROLLER

Brand and Time of Spraying	No of Trees Examined	Condition of Foliage
Dormoil, 1 to 11½ April 25, 1921	25	Twenty-four trees slightly injured—general appearance fine. One tree considerably injured, somewhat brownish in appearance.
Dormoil, 1 to 11½ April 30, 1921	25	Twenty-one very slightly injured—general appearance fine. Four trees slightly injured, general appearance fair.
Universal Brand, 1 to 11½ April 25, 1921	20	Eleven trees considerably injured—general appearance very ragged. Nine trees with nearly every leaf injured, general appearance brownish.
Universal Brand, 1 to 11½ April 30, 1921	25	Eleven trees slightly injured—general appearance fair. Fourteen trees considerably injured, general appearance ragged.
Scalecide, 1 to 11½ April 25, 1921	20	Twenty trees with every leaf injured and many reduced to stubs. General appearance ragged and brownish.
Scalecide, 1 to 15 April 25, 1921	20	Twenty trees with every leaf injured and many reduced to stubs. General appearance ragged and brownish.
Scalecide, 1 to 15 April 30, 1921	25	Five trees very slightly injured—general appearance fine. Thirteen trees slightly injured, general appearance fair. Eight trees considerably injured, general appearance ragged. Four trees with nearly every leaf injured, some reduced to stubs, general appearance very ragged and brownish.
Spra-Mulsion, 1 to 8 April 25, 1921	25	Twenty-five trees with every leaf injured and many reduced to stubs. General appearance very ragged and brownish.
Spra-Mulsion, 1 to 8 April 25, 1921	25	Twenty-five trees with every leaf injured and many reduced to stubs. General appearance very ragged and brownish.

after learning of this evident failure. After studying the composition of Spra-Mulsion it seemed that it was not the right type of miscible oil for leaf-roller control and that possibly there might be other miscible oils that would give better results. It was decided to find out by correspondence with entomologists in states where the leaf-roller had occurred just what brands had given best results and then to try these out under Montana conditions. The result of correspondence led us to select Scalecide, manufactured by the B. G. Pratt Company; Dormoil, manufactured by the Hood River Spray Company; and Universal Brand Dormant Soluble Oil, manufactured by the General Chemical Company. Of these three, Scalecide seemed to be the most highly recommended, but was also by far the most expensive, largely because of the high freight charges from the point of manufacture in the east.

Preliminary tests of these oils were conducted during the winter months in order that we might be able to advise the fruit growers which to buy the following spring. It was realized that this was not an ideal time to conduct leaf-roller contact experiments, but it was believed that that the oil which would give the best results under winter conditions would also give the best results when used in the spring and this later proved true.

The tests were conducted at the University Heights orchard on December 1. Five gallons of each oil were used, "Dormoil" and "Dormant Soluble Oil" being diluted 1 to 12½, and "Scalecide" 1 to 15. A power outfit equipped with spray guns was used. The trees were very carefully sprayed and were completely drenched. The weather at the time of spraying was quite mild with a temperature of about 50 degrees at mid-day. Three weeks after the trees were sprayed a quantity of branches heavily infested with egg-masses was cut from each tree and held in a warm greenhouse until egg-hatching on unsprayed check branches was complete.

For comparison with the outdoor spraying, infested branches from the same trees were sprayed with a hand sprayer in a warm greenhouse, where they were held until egg-hatching on unsprayed checks was completed. The same oils and the same dilutions were used as in the outdoor tests.

In both tests hatching began in 28 days after the branches were taken into the greenhouse and continued over a period of nearly three weeks. After hatching was completed on the unsprayed branches each egg-mass was examined and classed as hatched if five or more individual eggs were hatched. All counts were restricted to egg-masses deposited during the season of 1920, all old egg-masses having been previously removed. The results are shown in Table I.

It will be seen from Table I that Dormoil was the most effective in both the indoor and outdoor tests and it was, therefore, recommended to the fruit growers for the season of 1921.

Spring Spraying Experiments in 1921—It was realized that the winter spraying tests were conducted on a very small scale and at a time when the best results perhaps could not be expected. It was, therefore, decided to conduct comparative tests of the same materials on a larger scale in the spring just before the eggs hatched. In this experiment 50 gallon lots of Dormoil, Scalecide and Universal Brand Dormant Soluble Oil and Spra-Mulsion were used. Dormoil and Universal Brand Dormant Soluble Oil were used at the rate of 16 gallons of oil to 184 gallons of water, or 1 to 11.5. Scalecide was used at the strength recommended by the manufacturer, 1 to 15, and also at 1 to 11.5 in order to compare it directly with the others. Spra-Mulsion was used at the rate of 22 gallons to 178 gallons of water, or 1 to 8.

Adjacent blocks of uniformly heavily infested 15-year-old trees were used for the experiment. The first spraying was done on April 25, the weather on this date being cool and cloudy, with a temperature of 40 to 45 degrees during the greater part of the day. About an inch of snow fell duing the night, but this was blown off the trees the next morning without wetting the bark to any extent.

BECAUSE of the somewhat unfavorable weather conditions which followed the first spraying, the tests were repeated on additional unsprayed trees on April 30. The weather on this date was warm and bright as was also the day following. The second day after spraying was cooler and there were light showers. Spraying day on both dates was done with power outfits, using spray guns and a pressure of 250 to 300 pounds.

The leaf-roller eggs at the time of the spraying were well incubated and by careful searching a larva could now and then be found. The leaf buds were almost breaking. The effectiveness of the various sprays was judged by a careful examination of 20 to 25 trees in each plot during the last week in May. The percentage of unhatched eggs and the number of leaf-roller larvae present on the trees were the factors upon which effectiveness was judged at this examination. Any evidence of spray injury was also noted. The results of the two sprayings are given in Table II.

During the second week in July, at which time larval feeding was practically over, the various plots were again carefully examined with the object of determining the amount of injury to the foliage which the trees had suffered as a result of the feeding of the leaf-roller larvæ. All of the sprayed trees had been almost completely defoliated the previous year, thus preventing the formation of fruit buds and in judging the amount of injury we were confined entirely to the foliage. The amount of injury in the various plots is shown in Table III.

The amount of foliage injury on all the plots was less than would be expected on the basis of the percentage of the eggs that hatched and it is believed that the percentage of unhatched eggs cannot be taken as the true percentage of control. There seems to be a very high mortality among newly hatched larvæ from sprayed egg-masses and it may be that many larvæ within the egg-masses are almost killed by the oil, but still have life enough to eat through the egg shell and then perish shortly after they emerge.

Summary of Results—Dormoil, at the strength of 1 to 11.5, gave the best results in both winter and spring spraying tests. Practically no spray injury resulted from the use of this oil at the above strength and leaf-roller injury to the foliage was so reduced that it was scarcely noticeable. A

(*Continued on page* 21)

TABLE III—SHOWING AMOUNT OF DAMAGE TO FOLIAGE BY LEAF ROLLER LARVAE ON PLOT SPRAYED WITH VARIOUS MISCIBLE OILS

	Egg Masses Counted	Percentage Unhatched	Larvae per Foot of Branch	Spray Injury
Dormoil, 1 to 11 April 25, 1921	1607	73.6	.5	No injury on any of 25 trees sprayed.
Dormoil, 1 to 11½ April 30, 1921	2357	74.5	.4	Slight injury noted on 5 out of 25 trees sprayed.
Universal Brand, 1 to 11½ April 25, 1921	1097	31.0	3.0	Seven slightly injured and one badly out of 20 trees sprayed.
Universal Brand, 1 to 11½ April 30, 1921	2162	63.4	.9	Thirteen slightly and four badly injured out of 25 trees sprayed.
Scalecide, 1 to 11½ April 25, 1921	1180	41.1	3.1	Fifteen badly injured and five slightly out of 20 trees sprayed.
Scalecide, 1 to 15 April 25, 1921	1363	25.9	3.4	Ten badly injured and five slightly out of 20 trees sprayed.
Scalecide, 1 to 15 April 30, 1921	2417	37.8	1.9	Two badly injured and six slightly out of 25 sprayed.
Spra-Mulsion, 1 to 8 April 25, 1921	1605	16.5	5.8	No injury on any of 25 trees sprayed.
Spra-Mulsion, 1 to 8 April 30, 1921	2621	33.3	3.3	No injury on any of 25 trees sprayed.

Soil Fertility As Related to Orcharding

By CLAYTON L. LONG
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THE most successful orchardist is the one who recognizes the several necessary fundamentals of fruit growing and is capable of classifying them in order of their importance for his own particular orchard. These essentials he groups as follows:

1. Soil management, including the maintenance of a proper soil moisture, an abundant supply of organic matter incorporated in the soil and a sufficient and properly balanced soil fertility.

2. Pruning, for the purpose of maintaining a more equal distribution of light to the entire leaf surface; a common sense distribution of the fruiting wood and for facilitating pest control.

3. Pest control, including the prevention or cure of economic injury from rodent, insect or disease pests.

4. Thinning of the fruit for the purpose of producing a more marketable at a greater profit to himself.

These four fundamentals of his business he not only considers individually, but collectively, together making up the one most profitable method of handling his orchard. No one of them is decided upon or adopted before he determines the effect it will have upon the system as a whole or upon any one of the others.

Two groups of food	Necessary Elements	Sources of Supply	Amounts needed	Factors limiting total supply
Air	Carbon	Air	95 + % of food Requirements	Amount green color leaf surface exposed to good light.
	Oxygen	Air or water		
Food	Hydrogen	Water		
Soil	Nitrogen	Organic Matter	5 - % of food Requirements	Size of feeding and root area and amount of available soil fertility. (Nitrogen carrying organic matter being limiting factor.
	Phosphorous	Mineral Matter of Soil		
Food	Potassium	Soil		
	Calcium	Soil		
	Magnesium	Soil		
	Sulfur	Soil		
	Iron	Soil		

Each step in his system of orchard management either tends to bring this year's crop of fruit to maturity in the most profitable condition or to maintain the vigor of the tree against its own natural tendency to become old or devitalized. He carries on his orchard practices for the continuation of a fairly vigorous wood growth as well as to bring about an annual crop of large, perfect, well colored fruit.

Soil management, the first of these four essentials, and by far the most fundamental, is the subject here treated. The management of anything, to be a real success, should be based upon a thorough knowledge of the subject to be managed. An orchard soil is no exception. While it is impossible here to make a thorough study of any particular orchard soil, it is possible to study a general one. Such a soil is a porous mass of rock and organic particles, moistened with that water retained after thorough under-drainage, ventilated by a slow circulation of air and alive with minute organisms.

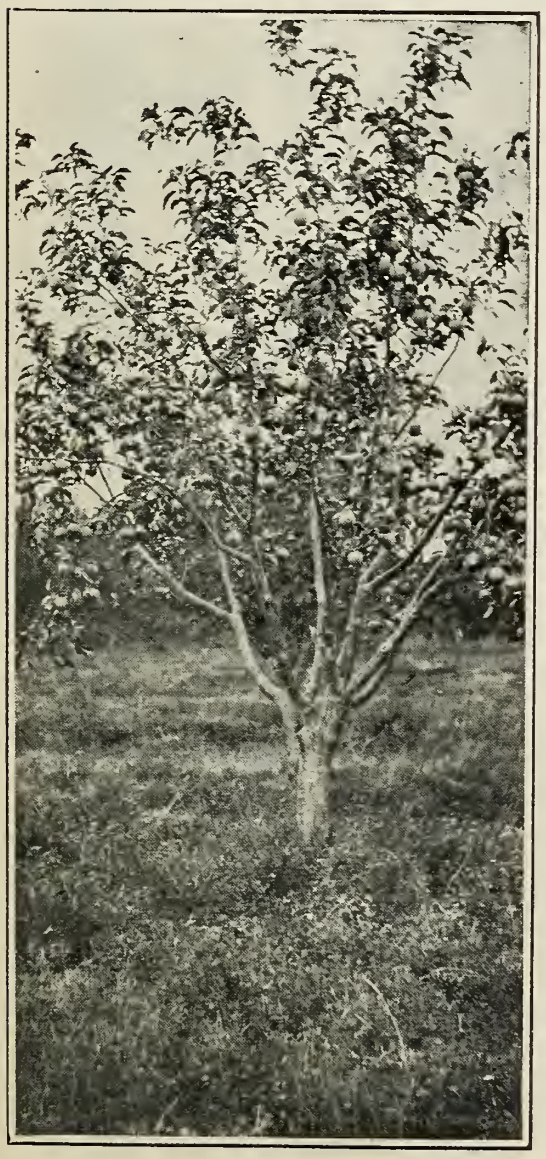
There are ten elements of materials necessary for tree growth or fruit production. These are carbon, hydrogen, oxygen, nitrogen, phosphorous, patassium, calcium, magnesium, sulfur, and iron. No fruit tree can live or produce without all of these.

The first three elements, carbon, hydrogen and oxygen, usually available in unlimited quantities from air and water, make up approximately ninety-five percent of a fruit tree and its crop. The other seven, nitrogen, phosphorous, potassium, calcium, magnesium, sulfur, and iron combined supply the other five percent or thereabout. The last four, calcium, magnesium, sulfur, and iron are used by fruit trees in very limited amounts and are sufficiently supplied in common orchard soils. Where alfalfa is used as a permanent cover-crop in the orchard, sulfur may be used to advantage.

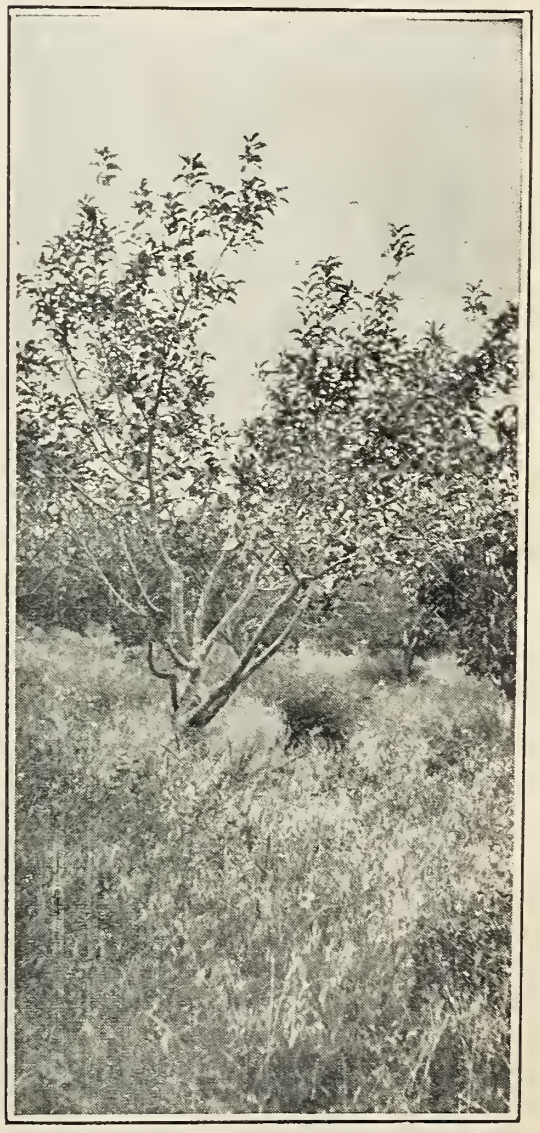
Two of the remaining three elements—phosphorous and potassium—are used for growth and production in larger quantities and may, in the future, become limiting factors in fruit growing, but to date have been supplied in amounts great enough to meet all needs for growth and production.

THE remaining element, nitrogen, largely supplied by the organic matter of the soil, is the one to first disappear from cultivated soils. The organic matter, being the most unstable part of the soil, rapidly decays and disappears under the usual

(*Continued on page* 26)



Compare this apple yield, grown with alfalfa as cover crop, with that in opposite photo. These demonstration tracts are at Freewater, Oregon.



Here is typical apple tree, fruiting on a tract having grass cover crop. It is the same age as the tree shown in opposite column on this page.

Approved Culture of Red Raspberries

By G. E. Davis,
Sumner, Washington

Specific and practical information on the planting and cuture of red raspberries was given at the annual meeting of the Western Washington Horticultural Associattion, at Mt. Vernon, February 15-17, *by Mr. Davis, who knows every phase of the subject from the grower's standpoint. The information there given is presented here. The discussion gives details so carefully the beginner might use it as his only guide in planting and caring for a new yard. It is needless to point out that, coming as it does, from an authority of wide experience in the heart of one of the country's most famous berry sections, the article sets forth the most approved practices there in vogue.*

THE mild climate of the Pacific Northwest makes it especially well adapted to the growing of raspberries, but not all of the land is suitable to raspberry culture.

The soil best adapted for them is a well drained sandy loam or shot clay. If the natural drainage is not sufficient to keep the water from standing on the field, then tile or box drains should be put in. Care should be taken to avoid frost pockets as good air drainage is very essential.

Varieties—Of the 57 varieties, the Cuthbert, Antwerp, Marlboro, King and St. Regis are the most common.

The Marlboro and Antwerp usually begin to ripen about June 15, which is ten days ahead of the Cuthbert.

The St. Regis is known as the everbearing, as it bears a light crop in the last of June and July, then bears another crop in September and on until the frost catches them. Only a few are grown and they are not profitable as a commercial berry.

The Marlboro, (or Red Cane), Antwerp and King are known as the sour raspberries. They have stout upright canes, they yield heavily and are good shippers, but are poor berries for the cannery, as they cook to pieces.

The Cuthbert has tall slim canes that droop when loaded with fruit or foliage.

The berries are sweet, of fine texture, good shippers, remain whole when cooked, and are what the canners all want. So I shall confine myself principally to the Cuthbert.

Preparations for Planting—The field should be well plowed. If there is any sod it should be thouroughly disced and harrowed, and put in fine condition for planting. Then, with a marker, lay off the field in rows, seven feet apart. It is best to run the rows north and south as it is much cooler for the pickers and the berries do not sun scald, as they do if the rows run east and west. Then furrow out the rows with an eight-inch plow or a potato hiller, going twice in a row.

Obtain plants from a one-year-old field that are free from disease and cut them back to about 12 to 15 inches long. Put two plants in a hill, 2½ feet apart. It will require 5,000 plants per acre. The planting may be done in fall or spring.

I recommend two plants to the hill because you never have enough canes the first year. Although some plants are sure to die, they will seldom both die in the same hill, therefore you will have practically a perfect stand. Some root crop, such as potatoes, cabbage or kale, may be grown between the rows the first year.

I think the furrow system is much better than planting with a spade as you are very apt to plant too shallow, and as raspberries always grow up, one crown on top of the preceeding year. It is much better to get them too deep than too shallow, and again, with the furrow system, you gradually work the dirt toward the plants covering the weeds and save hoeing.

Posts and Wire for New Field—The posts should be 7 feet long with 8 inch face, set about 40 feet apart. The end or anchor posts, 7½ feet long, should be set at least 3 feet in the ground, the center posts 2½ feet. By setting them 40 feet apart it requires 150 posts per acre. Use No. 12 wire, putting 2 wires on the east or face of the row, one about 3 feet high to hold the young canes, the other 4½ feet to support the bearing canes. Put one wire on the west, or back, side of the row to hold the young canes. For convenience in adjusting, the wire should not be stapled to the end posts, but wrapped around the post, then, with an end about 3 feet long, twist back around wire.

It requires 140 lbs. of No. 12 wire per acre. Use two 10-penny nails on the back or west side of posts, driven at 45 degree angle, one 3 feet from the ground, the other 4½ feet. When the young canes get about 3½ feet high, raise the wire, swing it out over the canes and hook it back on the bottom nail. Then, later in the season, raise the wire to the top nail.

Cultivation—The ground should be stirred every week or ten days with planet jr. cultivator, spike-tooth harrow or spring-tooth cultivator, but always set the tooth that runs next to the row one half inch shallower than the others so as not to disturb the roots of the plants. It is a good plan to harrow with spike-tooth after a rain. This keeps the ground from forming a crust and losing the moisture, as we need to conserve all the moisture possible during the summer months.

Removing Old Canes—The old and all surplus canes over six to the hill may be removed as soon as the picking season is over, or may be left until the next spring when they are easily broken out, carried out and burned. I use the latter system in my yards.

Weaving—With 5 or 6 canes to the hill, divide the hill and bring the canes over the top of wire and in behind the end post. Take the rest of the hill over the top of the wire and in behind the part of the hill you have just woven and so on, being careful not to draw the canes down on the wire too tight. Leave them up 1 or 2 inches so every bud may come out and mature.

Then, with a pair of hand clippers, cut off the ends of the canes where they lap past the next hill, usually cutting off 1 or 2 feet.

Fertilizer—Berries require lots of fertilizer. In my yards I have been applying 10 tons of cow or sheep manure per acre, for several years. This should be put on in February. If you can not get barnyard manure, then use one-half ton or more per acre of some commercial berry fertilizer, with an analysis of 2-10-2 or higher.

Plowing—This should be done early in the spring. Open two furrows or dead furrows in the middle of the row, as deep as you can plow with a one horse plow. Harrow this thoroughly, then plow these back and on over as close to the row as possible, plowing about 1 inch deep next to the row. Harrow immediately after. Cultivate, then keep cultivating all summer, as that is the secret of successful berry raising.

Hoeing—Berries should be hoed early. Too many growers do not hoe until the weeds are a foot high thinking it cheaper to hoe only once. But it is cheaper and much better for the crop to hoe twice or even three times.

In May go through the berries with a V-shaped scraper that shoves the dirt over to the rows. Then, with a short handle garden rake or potato fork, draw the dirt up to the row. This keeps a fine dust mulch for the rest of the season.

Thinning Young Canes—This should be done when they are about 2 feet high. Care should be taken to select the strongest ones. Leave about 6 or 7 to the hill, as some are apt to get broken in picking.

Picking—Here is where the greatest care should be exercised. No matter how

good berries you may grow, if they are not properly picked, that is "picked clean," not crushed or broken, they will not and cannot command a good price in the fresh market or in the cannery.

Moss and lichens will not grow on trees that are regularly sprayed for the usual pests and diseases.

In pruning apples cut out all mildewed twigs as the buds on these twigs carry infection and will prove a source of disease next year. Prune for an open tree also, as thorough spraying is difficult where the branches are thick.

Control of Anthracnose, or Canker

By E. W. White

District Horticulturist, Department of Agriculture, Victoria, B. C.

(*Continued From Last Month*)

IN 1918 the experiment was continued as in 1916 and 1917. The early spray of 3-4-40 Bordeaux was applied on September 17. The new wood had so increased that it required 90 gallons of spray mixture for the 18 trees in Plots 1 and 2, or an average of 5 gallons per tree.

Cost of the first spray was as follows:

6¾ lbs. Copper Sulphate at .19	$1.28½
9 lbs. Lime at .02	.18
2 nozzle-men, 1 hour at .40	.80
Man and team, 1 hour at $6.50 per day	.81¼
Total Cost	$3.07½
Cost per tree, first spray	17.1 cents

September and October continued very dry, which hastened the maturity of the apples, which were all harvested on October 23. The crop was considerably lighter than in 1917, averaging about 4 boxes per tree, it being the off-year for bearing. It was so dry during September and October that when the apples were harvested there was no water available for spraying. A few days later it started to rain, and it was not until November 11 that a suitable day occurred, and despite the fact that this was Armistice Day, we made the application, because we were not calling any armistice with the canker, even though we had it beaten.

Cost of the second spray was as follows:

12 lbs. Copper Sulphate at .19	$2.28
12 lbs. Lime at .02	.24
2 nozzle-men, 1 hour at .40	.80
Man and team, 1 hour at $6.50 per day	.81¼
Total Cost	$4.13¼
Cost per tree, second application	22.95 cents

The cost of copper sulphate was a little less in 1918 than in 1917, but labor increased in price, so the cost per tree was about the same.

STORING AND PACKING OF SPRAYED APPLES, 1918—Our previous experience was repeated in 1918. The apples were packed up late in December and it was unnecessary to wipe the fruit. The sprayed apples again showed remarkable superiority in keeping qualities and in freedom from rot infection in the fruit.

COUNTS OF INFECTION, 1919—On May 29, 1919, Mr. Eastham again made the counts on the trees.

Plot 1—early spray, all 9 trees were examined and only showed a total of 13 cankers, or 1 4/9 per tree; 3 trees out of the 9 showed no infection at all.

Plot 2—early and late spray, all 9 trees were examined and only showed a total of 6 cankers, or 2/3 of a canker per tree; 5 trees out of the 9 were absolutely clean.

Plot 3—late spray, all 9 trees were ex-

(*Continued on page* 18)

Death to Peach Borers

VERY satisfactory success in treating peach trees for peach tree borer with paradichlorobensene—call it PC benzine, for short—has been reported at the Pennsylvania State College by Professor E. H. Hodgkiss. Experiments there seemed to indicate that this substance had possibly better not be used on apple trees. It is safe, however, for plums and prunes, should these be attacked by the borers. The substance of a report on the paradichlorobensene treatment experiments directed by Professor Hodgkiss is here given:

The peach tree borer is, in this state, a single-brooded insect. The eggs may be deposited anywhere on the leaves, limbs, or bark, to the number of 200 to 600, with an average of about 300. The larvae or "worms" hatch in ten days and crawl down the trunk and soon commence to gnaw their way into the bark, especially near the ground. The moth or mature insect is a day-flyer, resembling a wasp.

The PC benzine is a crystalline substance, which is readily volatile with fumes or gas which sinks down through the earth and find the borers beneath and kills them, if applied properly. It is not poisonous to man if not eaten or taken internally.

To apply the PC benzine, level the ground around the tree, remove the gum, and sprinkle the small crystals on the damp earth in a ring around the tree two inches from the trunk. Then throw a shovelful of earth against the trunk and let it fall back over the crystals, and follow this by mounding earth around the trunk from three to six inches high, and firm it by patting with the shovel.

The proper amount is three-fourths of an ounce on trees 6 years of age and older, and one-half ounce on trees from 3 to 6 years of age. Do not use it on trees less than 3 years of age, because of the danger of killing young trees. On trees 2 to 3 years of age tests were made to discover if short exposures could be made with safety to the trees. Examination of the older trees after a period of 14 days showed that the borers were practically all dead.

Experiments were made in regard to the distance from the trees. Some of the material was placed at a distance of two inches, and some at one inch from the trunk, with no difference in results; but the New Jersey State Experiment Station has shown that when placed at a distance of four inches or more, it is ineffective. After a priod of four to six weeks it should be removed, if any is left. On damp soil it volatizes more rapidly than on dry, and on clay soil not so rapidly as on sandy or even as on shaly or other loose soil.

The cost of treatment is 3½ at 5½ cents per tree, including material and labor. The date of treatment should be in northern states, September 10 to 30th, but in the South it can be as late as the middle of October. No experiments have been made in early spring applications. It is well to try it in the spring when the soil temperature has reached 50 to 55 degrees.

The material "appears to be rather injurious to apple trees," according to tests, and it is thought that it can be used safely on plum, but the tests are insufficient to form a basis for positive statements. No injuries by the material have yet been been observed on cherry and quince trees. Peach and other trees, 1, 2, and 3 years of age, are too young to be treated, as it injures them.

Two points are emphasized: It is safest to keep the material two inches from the trunk of the tree, and the mounds should be removed the next spring.

Gummosis of The Cherry

By C. A. Tonneson
Nurseryman, Burton, Washington

FIELD observations of the gummosis malady of the cherry trees have led to the conclusion that late fall growing, with unripened condition of cambium and sapwood, is a prevalent cause, though there may be bacterial and other factors.

In the State of Washington there are numerous valleys with a rich sandy loam soil, where the moisture is ample to keep young orchard trees growing profusely during the months of July and August. Then, with the early September rain and a mild temperature, the leaves are retained and do not cease to provide nourishment until very late, some years in December. With a sudden drop of temperature to some point below freezing, it appears, the cambium, as it is being transformed into green sapwood, is easily injured. As a result tissues are broken at one or more weak places in the bark and the exudation of the gum appears next spring.

It has been observed that, with young orchards planted on hillside clay soils close to those in the valley, but on a drier soil where wood growth is decidedly checked during the month of August, that despite the same September rain, these hillside trees are, as a rule, too nearly ripened up for the season to make any material further growth. As compared with trees in the soils which have ample moisture for continuous and late growing, the trees which are under conditions to ripen up earlier have much less gummosis.

If this is one of the prime causes of gummosis the remedy then is to aid nature and hasten the ripening process before the winter season. Where the trees are growing on sub-irrigated soils the reduction of moisture may be beyond control, but the orchardist can reduce the sources of nourishment and, to a material extent, check contious fall growth by pruning, which should be done from the middle to the last of August. By taking off from 15 to 25 per cent, and more where needed, of limbs and foliage the cambium-making power and new or continous growth is reduced to

that extent. Root pruning at this time would also help, but that is hardly practical in a large orchard, unless it is done by deep plowing at that time of the year.

About ten years ago a leading nurseryman experimented by top grafting on the Mazzard. This appeared to have reduced the difficulty to some extent. The native stock seem to be hardier than a stock of a sweet variety and naturally, for the first two years after top grafting, the flow of cambium-making material over the graft is slower than on trunks which are not top worked, hence the tendency for earlier fall cessation of growth.

After cherry trees come into bearing there is less injury from gummosis and increasingly so as the trees grow older. The nourishment derived from a vigorous growth is transformed into fruit and the good croppers usually assume the resting stage after fruit picking time and the production of new wood during the fall is reduced, even under the most favorable soil conditions of moisture and fertility.

(*Continued on page* 22)

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VOLUME XVI. NO 9

Apple-Tree Census

Nowadays one seldom encounters among fruit men that old bugaboo—the conviction that in a few years orchards of the country would be producing far more fruit than could find a market; that overproduction through increased acreage would ruin the industry beyond recovery.

It is not the mere fact that fortuitous circumstances have given fairly good markets for fruits of the Northwest the last few years that has laid low the old bugaboo. Not all readers know or realize it, but it is a fact that could, unmanipulated figures point toward decreased production of apples, which we have particularly in mind.

The government census shows that in 1920 there were in the United States a little more than 115,000,000 apple trees. In 1910 there had been 151,000,000 apple trees. In 10 years the decrease amounted to 23.8 per cent.

Even more vitally to the point: In 1910 there were 60,000,000 young apple trees, not yet in bearing, while in 1920 there were but slightly more than 3,000,000 such trees.

These figures yield abundant encouragement to the man who thinks. They may rightly bring hesitation on the part of the grower who has been planning on getting out of the game.

The government's figures are not so divided as to show just where the greatest decrease in number of trees has been taking place. It certainly has not been in the box-apple states of the Northwest. It most certainly has been in old eastern states where orchardists never learned the real business of growing apples commercially, and where conditions, anyhow, doomed such attempts to failure.

Every reader can form his own deduction from these facts. How the conclusion can be anything but eminently encouraging is beyond our reasoning powers.

Value vs. Price

There is general understanding among our subscribers that BETTER FRUIT is not in that great group of journals known as "farm publications." It is a horticultural publication, of course, but, more specifically, it is to be classed as a technical magazine. As such, it has place with the highly specialized magazines of given industries, trades or professions.

Such magazines quite uniformly charge $2 to $4 for a year's subscription. BETTER FRUIT asks much less for subscriptions than the average of its class. It seeks to give value beyond its cost. Most subscribers so value it, as their letters constantly testify.

A further word about our subscription policy: In selling a three-year subscription at $2 or an occasional five-year subscripion at $3, we are not, in reality, giving a cut-rate. What we are doing is merely passing on to the subscriber the savings effected. The cost of obtaining renewals, whether through solicitors or letters, is considerable. Book-keeping and mailing list expenses on yearly renewals is a further expense.

The friend who subscribes for three years at a time easily saves us the dollar we deduct from his rate. He enables us to taboo solicitors and premiums and BETTER FRUIT takes pleasure in giving him the fruits of such savings.

Nuts as Food

Figures are not at hand for the past decade, but government reports show that the use of nuts as food increased 55.7 per cent in the decade of 1900-1910. It is hardly to be doubted that the increase has been proportionate since then. In the big city stores, for instance, it is not uncommon for them to sell tons of salted peanuts in a single day.

The eating of peanuts cultivates a fondness for most other kinds of nuts. The eating of nuts is not a passing fad. It is a habit that is growing, largely because based upon sound dietetics. On the tables of thousands of American families, nuts are coming to replace meat foods to an increasing extent—as they well may do.

The point of this for our readers is the fact that the foresighted rancher will do well to plant nut trees. Demand is on the increase and assured for the future. Most of our readers are in the restricted sections where nuts thrive. Those who neglect this opportunity now, we confidently predict, will not live many years before regretting that they did not set out some nut trees.

Canned Food Week

National canned foods week is at hand, having been set for March 1-8 by the National Canners' Association. Residents of our fruit sections may not observe the period by doing much purchasing of canned goods, but may well lend encouragement through a word of commendation to the grocer who makes a special display or otherwise joins in the week's campaign.

The cannery industry is so intimately linked with the fruit industry that no grower should neglect an opportunity to give it a boost.

Marketing War

EARLY in February the Northwestern Fruit Exchange, with headquarters at Seattle, one of the largest distributors of commercial apples in the world, passed into new hands with the resignation of the men who helped form the exchange 11 years ago. The change, which is said to place the fruit exchange in the hands of the American Fruit Growers, Inc., came as a surprise to the growers of Washington.

The old directorate which resigned included, W. F. Gwin, president; Reginald H. Parsons, chairman of the board; D. H. White, treasurer; A. A. Prince, secretary; Worral Wilson, general counsel, and John W. Langdon.

On February 20, these men incorporated at Olympia a new organization, the North American Fruit Exchange, with a capital of $100,000. It was stated that this selling body will be a rival of the one from which the organizers resigned. The North American's officers are: Reginald H. Parsons, chairman of the board; W. F. Gwin, president; A. R. Rule, vice-president; D. H. White, secretary-treasurer; A. A. Prince, sales manager; J. Curtis Robinson, traffic manager. These officers, with Worrall Wilson, compose the directorate.

New officers placed in control of the Northwestern Fruit Exchange, at the time the old officers went out, are these: J. A. Meade, president; H. G. Fletcher, vice-president and sales manager; J. E. Mestor, secretary, and H. H. King, treasurer. Fletcher, Keith L. Bullitt, a Seattle lawyer, and Walter B. Congdon are the other board members.

A third development came February 23, at Wenatchee, when members of the Skookum Association, which has always marketed entirely through the Northwestern Fruit Exchange, voted to permit its units to market where they please. This was accompanied by organization of a third marketing body, called the United Apple Growers. The officers are: W. S. Trimble, Entiat, president; F. H. Moses, Cashmere, vice-president; F. C. Paine, Omak, secretary; Harry J. Kerr, Okanogan, treasurer.

Cover Photo

This month's cover illustration, showing the Rainier apple, is presented through courtesy of the Washington Nursery Company, Toppenish, Wash., which has exclusive propagation rights for this promising variety. The Rainier, which was originated in Yakima Valley, has been under production and tests plenty long enough to prove its worth. It has been thoroughly investigated by government and other pomologists, who have given it high commendation. Its keeping qualities and flavor are particularly lauded.

Kindly do a double favor by mentioning *Better Fruit* when you answer one of the ads.

Poison for Mice

A poison recipe that works successfully with mice in the orchard has been used during the winter by H. M. Gilbert, of the Richey & Gilbert Company at Yakima, Washington. In preparing the bait, one teaspoonful of gloss starch is put in one-half pint of cold water, the mixture stirred into a pint of hot water and boiled until a clear paste. One ounce of strychnine alkaloid, finely powdered, and one ounce of baking soda is stirred into the starch to make a creamy mass, beating it until it is clear of lumps and flakes. To this is added one-fourth pint of heavy corn syrup and one teaspoonful of saccharin, dissolved in a little warm water. The starch is again beaten, poured over 20 quarts of rolled oats and mixed thoroughly.

Tree Stock Pests

Wood, crown, and root borers of various kinds that are very destructive to fruit trees and berry vines are often brought on the place in nursery stock. Special care must be taken in getting plants from other growers to see that fields from which they are taken are free from these pests. All nursery stock should be rigidly inspected before planting and any plants that show sunken areas, bleeding sap, or "wormwood"—which is the frass excreted—should be discarded or returned.

Control of Anthracnose

(*Continued from page* 12)

amined and showed a total of 130 cankers, or 14 4/9 per tree.

Plot 4—check-plot, one tree examined showed 49 cankers.

Although our work on this plot really ceased with the counts made in May 1919, it is very interesting to note that the crop in the fall of 1919 averaged slightly over 9 boxes to the tree. This increase is attributed almost entirely to the new bearing wood which had been developed in the trees in the previous three years.

SUMMARY—In summing up the results of the first three years' work the following conclusions were reached:

1. An early spray is essential.
2. A weak Bordeaux will do the work if applied early enough.
3. The cost for the early spray for the three years was only 14.19 cents per tree.
4. This is higher than it need be, because material was at war prices and was bought in small quantities.
5. Early varieties may be picked before it is necessary to spray.
6. It was found unnecessary to wipe the fruit.
7. Fruit was left sticky, but no complaints were had when it was put on the market.
8. Covering of Bordeaux did not interfere with coloring of fruit; it seemed to improve it.
9. Anthracnose rot infection on the fruit was controlled practically 100 per cent.. Keeping qualities were also improved.
10. The disease can be controlled if growers will only carry out the spraying systematically each year.

In the fall of 1919 another series of experiments was outlined, as it was desired to test the effect of an early application of 3-4-40 Bordeaux to the King apple, a variety most largely grown on Vancouver Island, and one which is ready for market about the end of September.

It was also desired to test the effectiveness of Burgundy mixture (1 lb. Bluestone, 1½ lbs. washing soda, and 40 gallons water) as an early spray and also a fall application of 1 to 9 lime sulfur after the fruit was picked.

An acre of 14-year-old Kings, consisting of 45 trees, was selected in Stewart Bros. orchard, Keating, and this was divided into 5 plots of 9 trees each with one tree in each plot left as a check.

This block of Kings had been bearing very consistently up to about 12 years of age, but in the thirteenth and fourteenth years it had gone back very rapidly and when it was taken over practically every terminal growth was dead. An endeavor was made to count the infection on the one and two-year-old wood on each tree before the plots were sprayed and this count showed an average of 88 cankers per tree over the entire 45 trees. This count was much below the real infection

The first week of September, 1919, was wet and it was not until September 12 that Plot 1 was sprayed with 3-4-40 Bordeaux and Plot 2 was sprayed with 1-1½-40 Burgundy.

On November 6 Plot 3 was sprayed with 3-4-40 Bordeaux and Plot 4 was sprayed

with 6-6-40 Bordeaux. The next day, November, 7, Plot 5 was sprayed with 1 to 9 lime-sulfur.

WHEN the fruit was harvested it was found difficult to wipe off the coating of Bordeaux from the apples of Plot 1 so that they could be harvested immediately. However, the apples from Plot 2 which was sprayed with Burgundy showed pracically no deposit at all.

Early in the spring the trees were given quite a heavy pruning and an endeavor was made to cut out all dead wood. The trees all had the same treatment so that the counts of infection made later would be on a uniform basis.

On May 11 and 12, 1920, the counts were made and showed the following results:

Plot 1—sprayed with 3-3-40 Bordeaux, on the 12th, September, 1919, 3 trees showed an average of 9 cankers per tree; check tree 75.

Plot 2—sprayed with 1-1½-40 Burgundy mixture, on the 12th September, 1919, 3 trees showed an average of 33 cankers per tree; check tree 125.

Plot 3—sprayed with 3-3-40 Bordeaux, on November 6, 1919, after the fruit was picked, 3 trees showed an average of 42 cankers per tree; check tree 101.

Plot 4—sprayed with 6-6-40 Bordeaux, on November 6, 1919, after the fruit was picked, 3 trees showed an average of 32 cankers per tree; check tree 140.

Plot 5—sprayed with 1 to 9 lime-sulfur on November 7, 1919, after the fruit was picked, 3 trees showed an average of 37 cankers per tree; check tree 92.

From the results of the experiments of the past years the following recommendations for the control of apple-tree anthracnose are being made:

During July and August an endeavor should be made to go through the orchard and cut out all signs of dead wood.

On early varieties such as Yellow Transparent, Duchess, Wealthy and Gravenstein, spray with 3-4-40 Bordeaux as soon as the fruit is picked and before the fall rains come. This spray is all that is necessary.

On varieties such as King and Jonathan, it is advised to spray the last week in August with 1-1½-40 Burgundy and to follow this with a 3-4-40 Bordeaux as soon as the fruit is picked.

With late varieties such as Baldwin and Spy, which are not harvested until the end of October and not marketed until January, it is advised to spray them the last week in August with a 3-4-40 Bordeaux and this will be all that is necessary.

The use of Burgundy for varieties such as King and Jonathan is recommended, due to the fact that this spray gives very efficient results and leaves no deposit on the fruit which will be harvested probably in October.

It is felt that this disease can be almost absolutely controlled if growers will only take the matter in hand.

Nearly 700 cars of apples were shipped from the Bitter Root Valley, Montana, up to January 1.

George Brown of New Era, Oregon, last season harvested 4500 bushels of potatoes from a 32-acre tract.

Fruit Varieties for Western Washington

By J. L. STAHL

Horticulturist Western Washington Experiment Station

IN CHOOSING varieties of fruit for planting, there are several important considerations, such as object and size of the plantation, location and market, besides the personal choice of the grower.

If a few trees only are planted on a city lot or small area, dwarf types are desirable. They can be planted close, will come in bearing young, are easily pruned, sprayed and the fruit harvested. Dwarfs are too expensive planted on a large area, as it requires several times the number of trees to set an acre as are needed for standards, and the cost per tree is as great. Where a choice of location is possible, it is usually best to plant fruit trees and grapes on uplands or hillsides rather than on lowlands. Berries can be grown successfully either on uplands or on well-drained valley lands where soil and frost conditions permit.

Personal choice should govern the varieties set for home use only. Fruits and varieties recommended below for general planting, are of good quality, are adapted to most localities in western Washington, and are in demand for market. Types and varieties recommended for trial may be desirable in many localities, but as yet have not been extensively planted. Grapes are proving very profitable in some localities and should be tried at least in a small way wherever possible to do so.

Fruits particularly in demand by canners in the following list are marked "(cannery)."

APPLES

Variety	Season
Yellow Transparent	Summer
Gravenstein	Early Fall
Wealthy	Early Fall
King	Fall
Grimes Golden	Winter
Wagener	Winter
Red Baldwin	Winter
Winter Banana	Winter
Northern Spy	Winter
For Trial.	
Glowing Coal	Fall
Delicious	Early Winter
Yellow Newtown	Winter

PLUMS

Peach	Early
Tragedy	Early
Reine Claude de Bavay (Green Gage)	Mid-season
Ponds Seedling (Hungarian Prune)	Mid-season
Sugar Prune	Mid-season
Italian Prune (cannery)	Late
Damson Plum (cannery)	Late

PEARS.

Variety	Season
Bartlett (cannery)	Late Summer
Louise (Bonne of Jersey)	Fall
Hardy	Fall
Comice	Early Winter
Bosc	Early Winter
Anjou	Early Winter
Winter Nelis	Early Winter
For Trial.	
Bordeaux	Winter
Pres. Drouard	Winter

CHERRIES

Variety	Color
Royal Ann (cannery)	Light
Black Republican, sweet	Dark
Bing, sweet	Dark
Montmorency, sour (cannery)	Red
Late Duke, semi-sweet	Red

QUINCES

Variety	
Orange	
Champion	

PEACHES (for trial)

Variety	Kind
Alexander	White (clingstone)
Amsden's June	White (clingstone)
Crawford's Early	Yellow (freestone)

LOGANBERRIES AND PHENOMENAL BERRIES (cannery)

Color, red; fruit, large; flavor, desirable.

RASPBERRIES

Variety	Season and Color
Marlboro	Early, Red
Antwerp	Season early; Dark Red
Cuthbert (cannery)	Red
Cumberland	Medium, Black
Kansas	Medium, Black

STRAWBERRIES

Variety	Season
Gold Dollar	Early
Marshall (cannery)	Medium
Goodell	Late
Wilson	Medium
Clark's Seedling (adapted to some localities)	Medium

Bush fruits, such as raspberries, loganberries and evergreen blackberries, may be pruned at any time now without real danger of further dieback from excessive cold.

CANNOT MISS AN ISSUE

Yakima, Wash. Feb. 13, 1922

BETTER FRUIT PUB. CO.,
Portland, Ore.

Dear Sirs: *Please let me know if I am in arrears. I have not missed a number yet and do not want to as* BETTER FRUIT *is very valuable to us as orchardists.*

Yours truly, H. A. JONES

HOMEMAKERS' CONFERENCE
OREGON AGRICULTURAL COLLEGE

Corvallis, March 20-25

"BETTER HOMES FOR OREGON"

Pictured in Lecture, Exhibit, Demonstration.
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Full Information on Any Subject by Writing Registrar, O. A. C., Corvallis, Oregon.

Miscible Oils and Leaf Roller

(*Continued from page* 8)

carload of this oil was used in leaf-roller infested orchards during the season of 1921 with very good results.

Universal Brand Dormant Soluble Oil gave fair results in the second spring spraying, but very poor results in the winter and first spring spraying. It also caused some spray injury and the injury to the foliage resulting from the work of the leaf-roller larvæ was enough to give all the trees a ragged appearance.

Scalecide gave poor results in all tests. In all the outdoor tests more than half the eggs hatched and the foliage was severely injured by the leaf-roller larvæ. Considerable spray injury also resulted from the use of this oil. It is difficult to explain the poor results secured with Scalecide when we consider that workers in other states have used it against the leaf-roller with marked success. The manufacturers suggested that the poor results in the winter spraying tests might be due to the fact that we first mixed the oil with an equal amount of water, thoroughly agitated it, and then added the remainder of the water instead of following their directions and adding the concentrated oil to the full amount of water. In the two spring sprayings the manufacturer's instructions were carried out to the letter, but with no better results. Spra-Mulsion, even though it was used much stronger than any of the other oils, gave very poor results. Great numbers of the eggs hatched and every leaf on all the trees was injured by the larvae, many being reduced to stubs.

Some Reliable Northwest Nurserymen

Gummosis of the Cherry

(*Continued from page* 15)

Cherry growers in the Pacific Northwest have found that a good rule for strict adherence, is to do all necessary pruning of cherry trees, young or old from the middle to the last of August, or, with bearing trees, as soon as the fruit has been picked. At that time it is easier to determine which branches to remove for better access of sunshine and the formation of hardier fruit spurs. When the crop is off, a tree has no further need of any surplus limbs and the sooner removed the better. As for trees two to five years old, growers have discoverd they can aid nature to ripen up wood growth and reduce gummosis by pruning judiciously during the latter part of August.

Montana Meeting

The twenty-fifth annual meeting of the State Horticultural Society of Montana was held at Stevensville, January 17-20, inclusive. Despite temperatures "far below zero," the sessions were well attended There was keen interest in the diversified program. The first day was devoted principally to soil topics; the second, to small fruits; the third, to potato growing, and the final day to orcharding problems.

Dr. J. E. Porter of Stevensville, was re-elected president and State Horticulturist W. L. Shovell was elected secretary-treasurer.

A new department has been added to enterprises of the Pehastin, (Wash.) Fruit Growers' Association, as it will install a plant to manufacture lime-sulfur spray materials. The capacity will be 2000 barrels a year.

The Folfax Fruit Growers' Association, Placer County, Cal., has barred from membership any person not eligible for citizenship. The action is directed against Orientals.

RE-READS MANY ARTICLES

Greenacres, Wash.
Feb. 13, 1922

BETTER FRUIT PUB. CO.,
Portland, Ore.

Gentlemen: I like BETTER FRUIT *fine. The articles are so well written and so instructive I lay each number away to refer back to it again and again as occasion arises.*

Yours,
D. E. MCKINARY

Pruning Studies in California

(*Continued from page 6*)

is a well known physical fact that the higher the concentration of a solution the lower is its freezing point. Therefore, the higher the concentration of the cell sap the more cold the tree is able to stand both during the winter and the succeeding spring.

Whitten reports that "in Missouri one plot of peach trees which had continued rank length growth until frost in autumn, had all the flowers killed at a temperature of 27 degrees. The following night the temperature dropped to 22 degrees. An adjoining plot of trees, which ceased length growth early, but which maintained healthy mature leaves to store plant food until autumn, endured the lower temperature safely without injury to their blossoms." Similar results have been obtained on various kinds of deciduous trees in California by using what the growers have termed the "long system."

ESSENTIALS of this new system are as follows:

After five or six satisfactory placed main laterals are secured on the young tree no more heading in general seems desirable. Further pruning consists of thinning-out or cutting back to laterals in case the tree or any of its parts grow out of reach. This thinning must be carried out that the proper ration between wood and fruit production is maintained. Under most conditions the uniform production of six to eight inches of new shoot growth over the whole apple or pear tree will prove sufficient to maintain this balance.

In the same way six to eight inches on sweet cherries, eight to ten inches on plums, prunes and almonds, ten to fifteen inches on apricots, and fifteen to thirty inches on peaches may be taken as an index of a proper vegetative vigor in these respective species. A comparatively light pruning is conducive to the development of healthy fruiting wood throughout the tree which, in this case, is not shaded out by the dense rank growth of new shoots which normally follows a severe heading back.

A thinning-out methods favors to the fullest extent the maximum development of tree and fruit. Young trees thus handled are at the same age larger both in top and growth; shorter but more numerous new laterals are formed and the admission of more light to the interior of the tree stimulates the production of a continuous fruit-spur system from the lowest crotch upward; come into bearing from one to three years earlier; are more prolific, with fruit better distributed over the tree; withstand drought and frost better, and, in most instances, pruning expense is less.

Trees pruned by a heading back process are smaller, less stocky, slow in cominng into bearing, do not bear maximum crops, are probably wasteful of water and are more subject to winter-kill and frost injury.

In conclusion it may be of interest to note certain yields which have been obtained on young trees in the University orchards with no irrigation and an average annual rainfall of sixteen inches, by using the above outlined methods. Climax plum trees which were lightly pruned, bore during the third season in the orchard, approximately a crate, and during the fourth season, two crates of fruit to the tree. At the same time, the heavily pruned trees produced no fruit the third and less than a half a crate the fourth season.

Likewise, lightly pruned apricot trees produced twenty pounds of fruit the third, and sixty pounds the fourth season; and prunes ten to twenty pounds of green fruit the fourth season. Heavily pruned apricots and prune trees of the same age produced pratically no crop.

Certain California growers have, during the past few seasons, by the so-called long system or modifications of the same, obtained most satisfactory yields, such, for example, as two tons per acre on a ten-acre orchard of two-year-old Lovell peach trees; twenty tons per acre on a twenty-acre orchard of four-year-old Tuscan Cling peaches; an average of three packed boxes per tree on a ten-acre orchard of five-year-old Bartlett pears.

English Appreciation of Our Apples

From a LONDON CORRESPONDENT

GROWERS in the Far Northwest will be interested in learning that their movements do not escape notice on this side of the Atlantic. English consumers have long appreciated the value of the fruits from the Pacific Coast, but probably never more than now, since, if it were not for the imports from the West, apples would be an expensive luxury, and, in these days of financial stringency, beyond the reach of the majority of the general public.

That leading London journal, *The Daily Telegraph*, which keeps its readers well informed on events throughout the world, including fruit growing operations, has recently focused attention upon the products of the Pacific Coast, making particular allusion to the transport facilities afforded by the new Panama route. As the writer points out, the apples, so far, have arrived in excellent condition.

Prominence is being given to the fruit at Covent Garden, particularly in the show rooms of Messrs. T. J. Poupart, Ltd. and the comments which the display has prompted will doubtless be read with interest by growers among whom BETTER FRUIT circulates. The article says:

"In no part of the world is the fruit-growing industry characterised by greater efficiency and enterprise than in the Far Northwest. Old methods are readily relinquished in order to afford play to new ideas, and this spirit of progress is now finding expression in a forward movement that has for its object a wider distribution of the fruits produced on the Pacific Coast. Allusion has occasionally been made to the possibilities of the Panama Canal in relation to the fruit industry in that part of the world. Last season, apples were forwarded to Europe by this route, and early this year, 1921, it was used by the California Fruit Growers' Exchange for the consignment of a quantity of oranges and lemons. These departures from the trans-continental line were experimental, and the bulk of the fruit products continued to travel across the American Continent to be shipped at ports on the East Coast.

"But the experiments were attended with so much success that this season has produced a radical change of policy in regard to transport, and growers in British Columbia, California, Oregon and Washington are now exporting apples regularly through the canal for Europe."

After pointing to the additional refrigerator space that is now being provided upon steamers for the conveyance of fruit from the Pacific Coast the writer adds:

"EXTENSIVE as the fruit growing industry is in British Columbia and the western states of America, it is rapidly expanding and the prosperity of the growers depends largely upon the popularity of their products in foreign markets. Hence the regulations that govern grading and packing operations, the inspection of the fruit intended for consumption abroad, and the efficiency of the organization among the growers, which is such an important factor in promoting the export trade.

"This western enterprise is not without interest to consumers in this country. For flavor, there is no apple in the world superior to that grown in England. But at the present time, when the majority of English apples have been marketed, we depend largely for our fruit upon Canada and the United States and, owing to the bumper harvest in the Far West the bulk of our supplies come from the Pacific Coast. There is no necessity to dwell upon the importance of these consignments in relation to prices. They mean cheaper apples. But more important than price, is

the quality of the fruit after its long sea voyage.

"This week large quantities of apples have arrived at Covent Garden from British Columbia, Oregon, and Washington—Jonathans, Newtowns, Spitzenbergs, McIntosh Reds, and other varieties—and it is not too much to say that never have apples been received in better condition. The shippers in the west are easily first as packers. Quality, size and color are carefully studied, and the attention paid to these important details explains the popularity of the fruit in foreign markets. But a feature of the consignments now being received is the freshness of the fruit, and importers attribute this not only to efficiency in refrigeration, but also to the advantages derived from the Panama Canal route."

The writer concludes by pointing out how the use of the new route will reduce the handling of the shipments to a minimum, and describes the Panama Canal as an important link between the fruit orchards of the Pacific Coast and markets in other countries.

In an interview on the subject of apple importations from the Northwest, W. Ravenhill, director of T. J. Poupart, Ltd., remarked:

"Northwestern apples have never arrived in better condition than those that have reached London by the Panama route, via Southampton. If apples can always be received here in a condition equal to that of the fruit which came on the *Moliere*, then I feel convinced that the trade will show a considerable increase, because purchases may be made with confidence. And, to sell such apples, is really a pleasure."

Spreader Helps Spray

Lead arsenate spray of half the usual strength, combined with a spreader, proved much more effective than the usual strength —4 pounds to 200 gallons water—without spreader, in tests for codling moth at the Oregon Agricultural College Experiment Station. The spreader used was calcium caseinate, 12 ounces to 200 gallons of spray. The gain was due to the even, uniform coating of poison with the spreader, as against a blotchy spread without it.

Soil Fertility in Orcharding

(*Continued from page* 9)

methods of management, leaving the trees with only a limited amount of this much needed element. In fact, some remarkable results in increased production as well as growth have been secured in orchards of the Northwest from the use of nitrate of soda, unaccompanied by any effort to return the burnt out organic matter. The larger chart illustrates the orchard feeding problems.

The paramount problem of the orchard men today is that of finding an economical means of returning to their soils this dissipated organic matter and then maintaining it. The moisture holding capacity of the soil, the number of minute organisms, the availability of the other soil elements, the physical handling of the soil, and the productiveness of the soil are all dependent upon this same organic matter. Indeed, it is generally conceded that the supplying of this one material, organic matter, in sufficient amounts constitutes the first and most fundamental step in rebuilding a worn out soil or maintaing a fertile one.

In order to comprehend fully the fertility problem as related to orcharding, it is well to consider the extent and sources of losses of fertility from orchard soils:

CHART II

Losses by Crops Removed

Fertility removed annually per acre by an apple orchard.

	Wood lbs.	Leaves lbs.	Fruit lbs.
Annual weight	3500	3500	24500
Nitrogen	11.3	35.6	16.2
Phosphoric acid	3.6	5.3	6.4
Potash	6.6	15.9	41.5

Totals; Annual weight, 31,500 lbs; nitrogen, 53.1 lbs; phosphoric acid, 15.3 lbs; potash, 64 lbs.

The above table shows that an acre of vigorous, producing apple trees removes nitrogen equal to that carried by 340 pounds of nitrate of soda; phosphoric acid equal to that carried by 95 pounds of 16 per cent super phosphate, and potash equal to that carried by 135 pounds of sulfate of potash.

Losses by Drainage and Leaching—If the fertility removed by the trees constituted the total loss the problem would not be so difficult, but there are losses through other channels as well. Fertility existing in a soluble form is liable to be lost in drainage water or by leaching down through the subsoil, beyond the feeding roots. The amount lost in this way depends upon the amount of soluble fertility, the nature of the sub-soil and the amount of rainfall.

The heavy rainfall and the mild, open winters in the Northwest are conditions ideal for such losses, and undoubtedly contribute greatly to the deterioration of these soils.

The most serious loss from this cause is that of nitrogen. This is the most deficient of the three key elements in our soils, especially where clean cultivation without annual cover-crops or manuring has been practiced. It is also the most expensive to supply, costing in commercial forms about twenty cents a pound.

Phosphorous lost by drainage is generally conceded to be small, as little of it exists in soluble form at any time. Potassium is lost in greater amounts, although not equaling the loss of nitrogen. The fruit soil contains large amounts of this element, but practically all of it exists in an insoluble form; hence, the loss of even a part of the soluble amount is of vital significance to the grower.

There is no investigation known to the writer which indicates the total loss of fertility in fruit growing and it is more or less hazardous to make an estimate. Taking everything into consideration, however, it will certaintly be within the facts to assume that where apples are grown under clean cultivation, there is an average annual loss of 200 pounds of nitrogen, 20 pounds of phosphorous and 75 pounds of potassium, equivalent to 1275 pounds of nitrate of soda, 285 pounds of 16 percent super-phosphate and 190 pounds of high grade sulfate of potash.

Counteracting Losses of Fertility—Whenever practical it is far better to prevent the loss of fertility than to replace it after it has disappeared. A feasible and economical means of preventing a part of this annual waste is that of growing a cover-crop.

Many orchardists go to great trouble and expense in hauling manure and buying

commercial fertilizers and neglect continuously the opportunity to grow cover-crops. An annual cover-crop of Oregon vetch, or one of the winter grains and Oregon vetch combined with the crop of leaves from the fruit trees, which is usually lost where no cover-crop is grown, will permanently maintain the supply of organic matter and nitrogen in a productive soil.

Worn out orchard soils can be brought back to life and productiveness by the same cover-crops if supplemented by a light top dressing of manure or 150 to 200 pounds of nitrate of soda applied broadcast at the time of seeding. This fertilizer will insure a rank growth of the cover-crop which could not be secured on a poor soil without some fertilizing, and soon replace the depleted organic matter of the soil, gradually decreasing the need of the fertilizer and finally doing away with them almost entirely.

Manure, straw or any other crop refuse available applied to these worn out soils will be of great help in their rejuvenation. None of these refuse materials should be permitted to go to waste within hauling distance of any commercial orchard. Wheat straw contains much nitrogen, phosphorous and potassium and a great bulk of soil improving organic matter.

Marketing News of Interest

APPLE PRICES have been tending upward in eastern buying centers, though wintry weather at many points in mid-February stopped movements to some extent and made the markets a little quiet. Shipping agents have found much of encouragement in the market situation. In fact, most of them see no reason now, they say, why northwestern crops should not clean up in entirely satisfactory manner, at acceptable prices. They are thus cleaning up, as a matter of fact.

At the New York auction February 18, Washington and Oregon apples sold as follows:

Twenty-three hundred and ten boxes Newtowns, extra fancy, large to very large, $3.25 @ 3.35; small to medium, $2.90 @ 3.20; very small, $2.25 @ 2.75; fancy large to very large, $2.80 @ 3.05; Seven hundred and ninety boxes Spitzenbergs, extra fancy, medium to large, $2.50 @ 3, few high as $3.15; small to very small, $2.20 @ 2.50. Thirty-eight hundred and twenty boxes Newtowns, extra fancy, large to very large, $3 @ 3.35; medium, $2.65 @ 2.80; small to very small, $2.10 @ 2.55; combined fancy and cull, all sizes, $2.40 @ 2.65.

Government reports on boxed apple shipments for the month of January, 1922 and 1921, car-lot shipments, respectively, compare as follows: California, 126 to 106; Idaho, 130 to 238; Oregon, 467 to 260; Washington, 2,045 to 1,123; other states, 88 to 87. Total shipments this January were 2,856, compared with 1,814 in January, 1921.

Boxed apple shipments of the season, up to February 1, are reported by the government to have been 48,280. This compares with car-lot shipments of 29,936 to the same date a year ago.

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ON FEBRUARY THIRD, the 1300th carload of the 1921 crop of boxed apples had been dispatched from Wenatchee, leaving about 1800 cars in storage in north central Washington, according to estimates made by the Great Northern railroad, the district horticulturist and the Wenatchee Valley Traffic Association. It is expected that if the price of Winesaps advances there will probably be from 500 to 1000 cars more sent out.

According to figures compiled by shippers, the apple crop of north central Washington for 1921 will return the growers about $16,500,000. It is confidently stated by shippers that this yield of $500 per acre for every acre in orchard is the highest returns secured from any agricultural or horticultural land in the United States for 1921.

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PRUNES are selling somewhat better in the East. Peaches and apricots are both high and scarce so neither are in serious competition with prunes. Encouraging orders have been coming to the big associations and a result has been the packing out of a number of carload shipments. Earlier predictions that the Northwest's crop will clean up quite thoroughly this spring are drawing towards fulfillment.

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DURING the first week of January, 220 cars of apples, 18 cars of onions and 10 cars of potatoes were shipped from Yakima Valley. This brought apple shipments for the season up to 9,301 cars and the total of all fruit shipments to 13,585 cars.

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EXPORT APPLE shipments from Portland for the 1921-22 season exceeded 400,000 boxes. One week's shipments aggregated 175,000 boxes. It is freely predicted that as the buying power returns in European countries and as shipping facilities are improved, apple exports through the Portland terminal will far exceed last season's record.

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TOTAL APPLE shipments from Hood River are expected to reach 2,224,000 boxes and to return to the growers the net aggregate of about $3,000,000, or close to $1.50 a box. From cull apples the growers will realize $100,000. Returns from other crops were estimated as: Strawberries, $90,000; pears, $55,000; cherries, $75,000, and from potatoes, $45,000.

WASHINGTON

AT THE annual meeting of the Yakima Fruit Growers' Association, President H. O. James was re-elected and the other officers named are these: E. D. Knight, vice-president; W. B. Armstrong, secretary; L. A. Cooper, assistant-secretary; C. H. Swigart, treasurer and general manager. The association now has a membership of about 275, with 3500 acres of fruit.

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OVER ADVANCES on the 1920 apple crop brought the Spokane Fruit Growers' Association into the hands of a receiver recently. The association was organized in 1914, and owned 13 warehouses in the Spokane Valley, Stevens County and Benton County. J. A. McMillan of Greenacres, the receiver, has announced that he expects to sell all holdings of the association. Assets are estimated at $250,000, and it is said the 1200 stockholder-members will sustain little, if any, loss.

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KENNEWICK seems assured of a fine new pre-cooling and storage plant, as a result of conferences recently held by officials of the Yakima Fruit Growers' Association. with which the Kennewick growers are affiliated. The plan is that local men interested assist in the financing by subscribing for 8 per cent second mortgage bonds.

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OFFICERS elected to serve the Edmonds Growers' Association this year were as follows: L. E. Keeton, president; George Addy, vice-president; J. J. Robinson, secretary; A. B. Lewis, treasurer. Co-operative purchase of spray materials and seed potatoes was agreed upon.

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VICE-PRESIDENT Robert H. Kipp, for 12 years manager of the Wenatchee Red Apple Company, has announced his resignation from that company and from several other organizations. He is leaving Spokane for Valley City, Ill., where he has purchased an interest in an established fruit firm, having 1200 acres in bearing orchard. His resignation follows the selling of holdings of his company in recent months.

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AT THE annual meeting and banquet of the Tieton Fruit Growers' Association, J. W. Tapp was re-elected president. His report showed that last season 37 cars of pears and 296 cars of apples had been shipped from Tieton. An agreement was made that ordinary pruning workers should be paid 30 cents an hour. As other officers of the association, J. C. Havner was chosen vice-president and F. J. Straka secretary-treasurer.

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THE Walla Walla Valley Fruit Growers' Association, recently organized at the state line and including growers both in Washington and Oregon, elected officers on February 1, at a meeting in Freewater. The directors are: S. A. Miller and Claude Harris, both of Milton, Oregon, A. W. Simmons, Fruitvale, Oregon, C. E. Berry, College Place, Washington, Julius Levy, E. P. Jensen and C. Schwald, all of Ferndale, Oregon.

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PETER LEVANDER, Wenatchee district, thinks he holds a world's record for production of Delicious apples. From one and one-half acres his crops for the past three years have been: 2215 boxes, 1919; nearly 1700 boxes, 1920, and nearly 1800 boxes last season. Gross returns for the three years have been $8280, $5100 and $4850, respectively.

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DIRECTORS for 1922 were recently elected by the Washington Growers' Association, with headquarters at Vancouver. Those elected were Fred W. Brooker, Frank Russell, Henry Grass, J. L. Davies, W. H. Wood, O. C. Bell, John Spurgeon and J. H. Leverett. The latter was elected to the board as representative of the potato growers.

AT THE annual meeting of the Columbia Fruit Union, West Salmon, held early in February, these trustees were elected: John G. Myers, E. M. Peck, A. R. Haynes, A. E. Glader, W. E. Miller, N. P. Mears and C. Warnecke. A resolution was adopted ruling that only stockholders may hereafter have use of the storage space of the union.

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ON HIS RETURN from headquarters of his company at Steubenville, O., John W. Langdon, general manager of the Stanton Investment Company tracts at Walla Walla, announced that his concern will market most of its fruit direct this season. The company has been marketing through the Skookum Packers' Association.

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HARRY C. BENSON has resigned as manager of the Cherry Lane Orchard, near Prosser, which position he held for eight years, and will take over management of a large orchard tract in the Wenatchee district. Cherry Lane Orchard contains 240 acres of highly developed, full-bearing commercial orchard. It is largely owned by Northern Pacific Railroad officials.

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FRUIT shipments from Selah in 1921 reached a total of 1,500 cars. This is an increase of 300 cars over shipments of 1920.

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THE BOHLKE FRUIT COMPANY, INC., incorporated in Seattle in 1920, has sold out to the General Produce Company. The men interested in the produce company are M. M. Reese, L. E. Brown, and C. T. Moffatt. They will continue business at the old location.

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OFFICERS have been named by the Grays Harbor Berry Growers' Association, as follows: J. W. Strubel, president; C. W. Musgrove, vice-president; C. N. Evans, secretary; W. L. Leonard, treasurer; Lewis Barg, George Weygardt and Mrs. M. Berg, trustees.

OREGON

ON FEBRUARY 18, the apple-canning season came to a close at the plant of the Hood River Canning Company. About 400 tons of Newtowns and Spitzenbergs were canned under a variety of labels. A goodly proportion was shipped abroad and I. R. Acheson, formerly a Hood River banker but now sales manager of the company, spent considerable time abroad looking after sales.

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G. M. FROST, member of the city council at Ashland and a prominent orchardist there, won first prize in a contest conducted by Stark Bros., at their nurseries at Louisana, Mo., with an exhibit of 10 Stark Delicious apples. There were competing entries from many sections of the country and he was highly complimented on the victory. Apples exhibited by Mr. Frost won blue ribbons at the Oregon State Fair and the Medford fruit exhibit.

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IN ORDER that Wasco County may have fullest development of its agricultural and horticultural resources, The Dalles-Wasco County Chamber of Commerce has formed a bureau called "The Agriculture and Horticulture Bureau." It will do important work in the way of advice on plantings and analysis of soil samples. W. S. Nelson, for four years connected with Libby, McNeil & Libby, has been placed in charge. His cannery experience will prove valuable in the matter of advice to those planting new acreages and the standardization of output.

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FOURTEEN acres of Persian walnut trees on the ranch of A. L. Page, near Jefferson, last season produced 16,000 pounds of nuts. The trees are 29 years old and withstood the cold snap of two winters ago in fine shape, damage being confined to loss of the 1920 crop.

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BERRY GROWERS of Hood River communities have been discussing the question of wages for the coming season. They figure that prices will return to about the pre-war level and, for this reason, are inclined to demand a return to the wages of 1912 and 1913, when day laborers were paid 20 cents an hour.

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IN ORDER properly to handle berry and fruit crops of its increased membership in the Newberg district, the Oregon Growers' Association has purchased the buildings and lot formerly held by the White Sox Orchard Company at that place. There are three buildings, two built of concrete blocks, and well located on the Southern Pacific line. Acreage of association members has almost doubled in the past year and last season's shipments included 125 tons of berries, 100 tons of cherries and 230 tons of prunes, in addition to apples, pears and walnuts.

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A CONFERENCE of ranchers and all persons interested in nut growing was held at Pacific University, Forest Grove, on February 21. There were some excellent discussions by experienced growers, who handled phases of the growing of walnuts and filberts. The meeting was arranged by D. G. Lilly, project leader in horticulture for the Washington County Farm Bureau, Ferd Groner and County Agent O. T. McWhorter.

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C. R. THOMPSON, who, for the past two seasons, was manager of the Sheridan plant of the Oregon Growers' Co-operative Association, has been transferred to The Dalles plant, succeeding J. H. Frazier, manager there last season.

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PROCESSING of prunes at the Dallas plant of the California Packing Corporation has extended through February, with a force of 35 workers on the job most of the time. Several carloads of prunes have been prepared for shipment to eastern markets and shipments of large size, one including 18,000 cases billed to New York, have gone forward.

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FOLLOWING a trip of inspection through the east, Frank J. Norton, who operates canneries at Roseburg and Drain, announced that his plants will be operated at full blast in anticipation of a strong demand for canned products this season. He expects to conduct extensive experiments with

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the canning of broccoli, as he says there is a big demand in the east for canned broccoli. Thus far the canning of this vegetable has not brought satisfactory results.

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ROSEBURG merchants are already busy agitating the question of resuming the annual berry festival, omitted last season when the city government refused to grant permits for carnival companies to have concessions at the festival. It is predicted that the merchants' association and fire department will unite this season in staging the festival and carnival.

CALIFORNIA

CALIFORNIA has discovered from figures of the National Canners' Association that its output of products for 1921 fell far below the usual average. The figures show a cannery output of less than 350,000 cases for the year. In recent years the state's pack had ranged close to 4,000,000 cases.

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AS A MEANS of combating ravages of the mealy bug in southern California orchards, J. P. Coy, horticultural inspector of San Bernardino County in urging the raising of millions of crypts, or Australian ladybugs, as they are more commonly known. These ladybugs are mortal enemies of the mealy bug, he states.

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THE California Cherry Growers' Associaton, at its annual meeting in San Francisco, elected these officers for 1922: F. W. Maddocks, president; A. B. Haslander, vice-president; C. Long, Jr., secretary.

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SEARS & NICHOLS Cannery Company, of Chillicothe, O., plans to put three new canneries in California—one in Fresno, one in the Sacramento Valley and a third in the Santa Clara Valley.

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FRED C. BROSIUS has resigned his position as horticultural commissioner of Sacramento County and has accepted the position of superintendent of nursery service, Bureau of Pest Control, State Department of Agriculture.

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THE SEED laboratory of the State Department of Agriculture and the government branch seed laboratory have been consolidated and established at Sacramento, where all samples of seeds that farmers or dealers may want tested are now to be sent.

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THE NEW prune packing plant planned by the California Prune and Apricot Growers is to be located at Napa. Colusa is said to be also in line for such a plant.

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A. H. HARRISON, for a time apple inspector for the Standardization Bureau at Watsonville, has left that service and taken a position with a new spray company at San Jose.

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LIBBY, McNEIL & LIBBY have let the contract for a $55,000 addition to their Sacramento plant.

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WATSONVILLE apple growers report that they will use very little soda nitrate spray this season, having found arsenate of lead superior for control of codling moth.

AN OBSERVATION experiment with 28 kinds of prunes in one orchard is to be conducted at Napa, with a view to discovering those kinds that may most profitably be grown there.

IDAHO

A NON-PROFIT, co-operative association has been formed as the Lewiston Valley Head Lettuce Association, with headquarters at Lewiston. It is for the purpose of assembling and preparing for market the lettuce produced by its members. Standard methods will be adopted for growing and packing. The directors elected are: F. C. Finney, Walter Eddy, A. V. McConnell, J. P. Michaelson and R. W. Woodward. Returns of more than $1000 an acre have been reported by more successful growers, for last season, and the lettuce industry is booming.

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GROWERS of Sandpoint, Hope, Clark's Fork, and Morton met recently and formed tentative plans for organization of an association. If the association is formed it is expected to be of material aid in getting orchards of Bonner county into more profitable production.

FRUIT GROWERS of Post Falls have signed up 600 acres and formed an association to be known as the Panhandle Fruit Growers. These men were elected as officers: D. H. Gwinn, president; Lee Brugger, vice-president; Mrs. John Richards, secretary-treasurer.

With the Poultry

WHITE DIARRHOEA

WHITE DIARRHOEA, one of the worst diseases to be encountered in raising chicks, is generally caused by infected eggs. The infection is usually contracted from the hen and is in the egg when it is laid. In rarer instances the germs may be only on the shell or about the nests. Moldy straw, chaff or grain is frequently responsible for the infection.

The obvious deduction is that trouble from this source should be avoided through prevention. Care should be taken that the flocks of the hatching pens or from which hatching eggs are obtained, be kept in prime condition. Likewise, if hens are used for hatching, care should be taken to see that they are clean and healthy.

Never pack the eggs intended for hatching purposes in any substance or place where there is mold or where it may develop. Keep the eggs in a dry, moderately cool place. They should be so spread out that the air may circulate around them.

If the diarrhoea appears after the chicks are hatched there is but little to be done in the way of treatment. Chicks that show symptoms or evidence of the disease should at once be removed from the brood. You may try methods of treatment for the sick chick, but this is seldom worth much trouble. It is more important to clean up the source of infection as fully as possible.

White diarrhoea may develop in chicks from one day to four weeks old. About the first symptom is an inclination to droop and huddle up in the brood and under cover. The chick usually sits long in one position, probably with eyes closed and refuses to eat. The wings droop and the plumage loses its lustre. Close watch of the brood for these symtoms will pay, as they appear before the diarrhoea actually shows up.

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HATCHING WEAKLINGS

MOST POULTRY raisers know it, yet the importance of the advice not to hatch from the eggs of pullets less than eight or nine months old is such that it may well bear repetition and reiteration. Eggs from yearling hens may be used with fair results but to hatch from eggs of younger layers courts trouble. While the eggs hatch well enough, the chicks from such eggs lack vitality and are susceptible to the diseases that beset weak chicks. For breeding purposes two-year old hens are best, as chicks from their eggs are more vigorous and hardy.

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LAYING CONTEST RATION

FOLLOWING is the ration given the hens at the Sonoma county Farm Bureau laying contest at Petaluma, California. Scratch feed—180 lbs. barley, 180 lbs. milo, 180 lbs. cracked corn. Mash—160 lbs. bran, 90 lbs. middlings, 130 lbs. ground corn, 60 lbs. ground barley, 50 lbs. meat scrap, 50 lbs. fish meal, 15 lbs. charcoal, 3 lbs. salt.

Scratch feed is fed in litter one-third early in the morning and two-thirds early in the afternoon. Mash is fed dry in hoppers and is before the birds at all times. Greens are fed both morning and afternoon in hoppers.

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SIZE, SHAPE and color of eggs are breeding problems just as much as the number of eggs produced by an individual is a breeding problem. All eggs incubated should be uniformly large and of a color characteristic of the breed. Each egg incubated should weigh at least two ounces. More uniformity in selecting eggs for hatching means a more uniform flock and product.

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GREEN FEED is necessary for hens if they are to be kept in the best breeding condition this time of the year. Finely chopped green rye or oats will serve the purpose well. Green feed is of great importance in producing fertile, hatchable eggs.

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CLEAN, DARK nests should be provided for the hens. Even aside from the matter of sanitary benefits, proper nests will mean a minimum of cracked and dirty eggs.

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AVOID extremes in feeding. Over-fat hens produce undesirable hatching eggs and offspring about equally as much as those seriously underfed.

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FREE RANGE is an important factor in having a healthy flock, but if it is out of the question be sure the birds are made to take enough compensating exercise.

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REGULATION marketing cases make an excellent receptacle in which to store eggs intended for hatching.

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Bee Poisoning

By A. E. Burdick

THE APIARY and the orchard—what a logical combination. When man was first made the Creator took some clay and breathed into it the breath of life and it became a living being. Then, among other creatures he made bees.

Now bees rob the flower stamens of their pollen, carrying away the load in little pockets on their legs, provided for that purpose. They reach down into the nectaries at the base of the corrola and drink up the aroma laden nectar. Fecundation is apparently no concern of theirs. They are poaching and, when laden with their golden treasure, wing their way to their hive—their home, the place that pulls the heartstrings of all animate creation.

Bees and the orchard—a fine and logical combination. But, come with me for a few moments to the home of a beekeeper, Mr. S., who lives midway between Grandview and Prosser, Wash.

In the season of 1919-20 Mr. S. had about 100 colonies of bees. The summer of 1920 saw them reduced to 20 colonies through spray poisoning. These wintered well and the spring of 1921 found him with 20 strong colonies, ready for the swarming in April.

Late in July he wrote me that his bees were being poisoned and that he hoped to be able to sell his small ranch, bees and everything, and move away, stating that both Mrs. S. and he were in poor health. In this letter he expressed the hope that I would come over and see them and this I did a few days later.

His bee-yard presented a gruesome sight. All the new swarms cast in April were dead. Starting without a store of honey and brood reserves they had quickly succumbed. Their empty hives stood there as grave markers only.

About 17 colonies of the old stock still showed evidence of life. Figuratively speaking, however, it was necessary to use a stethoscope and mirror to establish the fact. No guards were at the entrances and an occasional bee would enter unchallenged. Where was his great army of peaceful workers? They were everywhere in that neighborhood. With every step you crushed their dead bodies.

The scene reminded me of a despoiled and defeated army, without sufficient reserves to bury their dead, and what an unequal and despicable conflict! Their death was a travesty on justice. It was preventable and without justification.

The remedy is simple. It should be unlawful to spray an orchard with arsenate of lead while the orchard is in bloom, or while a cover crop beneath the trees is in bloom.

But let me focus again for a moment, on Mr. S. with your indulgence. He and Mrs. S. had planned to live out their allotted time in the little home there among the bees. He had been a successful beekeeper, a generous hearted neighbor and friend. But what a hardship they had encountered! Is it any wonder they talked of not being well and wishing to sell?

Yes, they can move on, driven from their Arcadia by greed and disregard for their fundamental rights. But already the frosts of more than 70 winters have thinned and whitened the hair of his head, and not far distant stands Charon and his boat.

Our Inquiry Department

I HAVE HEARD a great deal about the sex of strawberry plants and know there are those that fertilize themselves and those that do not. What I particularly want to know now, is how to tell the sex of strawberry plants. I will appreciate an answer and you need only give it in your inquiries column if you prefer. J. R. L., Idaho.

Practically the only way to tell the sex of strawberries is when they are in bloom. Look into the petals and observe the little threads within the circle of the white petals. If you find them all green in color and carrying no yellow knobs—flower dust or pollen—then you may know the plant is female only, or pistillate as the "plantologist" calls it. If the little threads all have yellow knobs on the tops, then the plant is male, or staminate.

As you evidently already know, there must be both kinds in the strawberry patch or you can get no berries. The staminate plants must fertilize the pistillate in order to set any fruit. More properly, it is generally the case that the flower has both stamens and pistils—threads with and without the pollen knobs—and thus pollenizes itself.

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CAN you give me any information regarding best methods for destroying the "borer" in prune trees?—G. T. H., Oregon.

You will find the subject handled in this issue, where the use of paradichlorobensene in killing borers is discussed. Experts seem well agreed that this poison is decidedly the most effective method yet developed for curbing the borer pest.

A FIVE-CAR order of extra fancy Winesaps was filled by the Wapato Fruit and Cold Storage Company for a Boston broker, who shipped them to reach London Christmas trade. Apple shipments were made to Norway and Scotland from Wapato, during the fall.

A government bulletin dealing with the codling moth is in course of preparation by E. J. Newcomer and W. D. Whitcomb, who have made a three-year study of the pest in Yakima Valley. These men are entomologists of the Department of Agriculture.

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BEES AND QUEENS—Keep bees to pollenize your fruit. Get more and better fruit. Make a profit off the fruit and bees too. Write for circulars. Nueces County Apiaries, Calallen, Texas.

"SUPERIOR" Foundation (Weed Process) and "Everything in Bee Supplies." Superior Honey Company, Ogden, Utah.

JOHNSON'S PACKAGE BEES and vigorous Italian queens. Safe arrival and satisfaction guaranteed. Write for reduced prices. George T. Johnson, 165 Raymond Avenue, San Jose, California.

80 COLONIES BEES in Ten Frame Hives, combs on wired foundation; no disease. Price $12.00 per colony. W. H. Dancer, Myrtle Point, Oregon.

POULTRY

BABY CHICKS—The kind that grow into healthy, vigorous, egg-producing hens. R. I. Reds, Barred Rocks and White Leghorns. Order now before our dates are all filled. Prices: R. I. Reds and Barred Rocks, $25 per hundred; White Leghorns, $20 per hundred. Write for prices on larger numbers. Portland Seed Company, 180 Front Street, Portland, Oregon.

BABY CHICKS—S. C. Rhode Island Reds, $22.50 per 100; S. C. White Leghorns, $18 per 100; all sold to April 6. Order now from old and established breeders who have made good on the merits of their stock. Maple Brook Poultry Farm, Southworth, Wash., Box 3.

WHITE LEGHORN Baby Chicks from egg machines, Corvallis bred. The place that produces world-record makers. Vigorous, heavy-laying, free range stock. Pre-war prices. Oregon Corvallis Hatchery, Corvallis, Oregon.

BABY CHICKS—Reduced prices on White Leghorns, Reds, Barred Rocks, White Rocks, Minorcas and Anconas. Booking orders now. Postal secures Free catalog. Write today. C. N. Needham, Salem, Oregon.

WHITE WANDOTTES—Egg Bred Males. Size and quality backed by high offical records. A. Gronewald, The Dalles, Oregon.

WINNERS—R. I. Reds (both combs), Toulouse Geese, Bronze Turkeys; stock and eggs for sale. J. Nonnemacher, Rt. 3, Yakima, Wash.

CHOICE Mammoth Bronze Turkey Toms, $10. Mrs. Amelia Reimers, Eagle, Idaho.

HEAVY LAYING STRAIN—S. C. Brown, S. C. White Leghorn hatching eggs, at fair prices. Deer Creek Stock Farm; Kerr Bros. Props., Sheridan, Oregon.

CHICKS from Acme Poultry Farm—Cottage Grove, Oregon; 100, $15.00; pen averaging 228 eggs, 100, $20.00; Lot and monthly reductions. White Leghorns. Safe delivery, guaranteed.

REAL ESTATE

WANT TO HEAR from owner having farm for sale; give particulars and lowest price. John J. Black, 197th street, Chippewa Falls, Wisconsin.

FORTY-THREE ACRES—Upper Hood River Valley, on new Loop Road around Mt. Hood; 15 acres commercial orchard, 10 years old, just coming into full bearing; 2 acres strawberries; 3 acres alfalfa; 4 acres under plow; fine potato land. Two good houses; two barns, one used for packing house; good stream, some free water; every acre under irrigation ditch; two miles from town; depot, stores, grade and high schools, church and library. One of choicest locations in upper valley. Fine view of Mt. Hood and Mt. Adams. Price $15,000, $6,000 cash. M. I. C., care Better Fruit.

BARGAIN—Fine 13-acre apple orchard, planted to Delicious, Grimes Golden and Jonathans; eleven years old; running water; well located; this would make an ideal fruit and poultry ranch. On good county road one mile from good educational town. For further particulars and price write Box G, Philomath, Benton County, Oregon.

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FOR SALE—Apple orchard, commencing to bear; finest box varieties; highest quality attained. Bolling Hall, Waynesville, N. C.

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THE A. L. JOHNSON CO., of Turlock, California, are prepared to offer many fine locations of California ranch and residence properties to interested parties at reasonable prices. For information write box 363, Turlock, California.

MISCELLANEOUS

TRACTOR BARGAINS—Cletrac "W," only demonstrated, $1250; Cletrac "W" rebuilt, good as new, $1000; Cleveland model "H," never used, $1100; Cleveland "H," slightly used, snap at $750; Oldsmar Garden Tractor demonstrator, $390. O. V. Badley, 425 E. Morrison, St., Portland, Oregon.

WANTED—To examine your orchard for you before you buy. I saved one man $5000 on a $14,000 deal. To look after orchards of non-resident owners. Many are poorly cared for and rapidly depreciating in value. Private pruning demonstrations and consultations given. Luke Powell, constulting horticulturist, Yakima, Wn.

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FOR SALE OR EXCHANGE—20 H. P. type N. Fairbanks Morse gas engine, direct gear driven with clutch to 10-inch brass-lined plunger pump all on one base; first class condition. Will sell engine separately, cheap, if taken at once. Also 25 H. P. 2-cylinder, Westman kerosene engine, direct connected by silent chain drive, to an American Pump 4-inch discharge, constructed for 65-foot head, rated at 480 gallons per minute. Ben L. Enos, Brewester, Wash.

KENTUCKY LEAF TOBACCO—3 years old, nature cured. Don't send a penny; pay for tobacco and postage on arrival. Extra fine quality chewing or smoking, 10 lbs., $3.00; medium quality smoking, 10 lbs., $1.25. Farmers' Union, D-65, Hawesville, Ky.

TOBACCO—Kentucky natural leaf chewing and smoking; rich, ripe, mellow; two years old; aged in wood; 10 lbs., $3; 20 lbs., $5; sample, 20c. Maddox Bros., Dept. 22, Mayfield, Ky.

HOMESPUN TOBACCO—Chewing, 10 pounds, $2.50; 20 pounds, $4; smoking, 10 pounds, $2; 20 pounds, $3.50. Farmers' Union, Mayfield, Ky.

FOR SALE—Hubam annual sweet clover; scarified seed; genuine Hughes strain; Free Sample. Jas. H. Kitchen, Rt. 5, Springfield, Ohio.

PEDIGREED White Scotch Collie Pups. Write for descriptive price list. Mrs. E. A. Bennet, Salem, Oregon.

TRY OUR INTRODUCTIONS—Wonderful new hybrid alfalfa. Write J. L. Lawson, reliable tree and seedman, San Jose, California.

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